

# Nosocomial Infections in Skilled Nursing Facilities: a Preliminary Survey

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NOSOCOMIAL INFECTIONS are a public health problem that adds significantly to the cost of hospital services, often at the patient's expense. Survey data indicate that 5 percent of all patients admitted to general hospitals in the United States acquire a nosocomial infection (1). In one study carried out in the mid-1960s in six community hospitals, an average nosocomial infection rate of 3.5 percent was found (2). In prevalence surveys conducted in 1972 and 1973 in 18 small hospitals in the northwest intermountain region, researchers found that 7.2 percent of the patients had infections acquired in the hospital (3). A 7 percent rate was observed during a year's surveillance in a Virginia university hospital (4). For a 6-month period in 1973, the National Nosocomial Infections Survey (NNIS), an ongoing study of nosocomial infection rates in hospitals differing in size and location across the country, documented monthly mean rates fluctuating between 2.9 and 3.5 percent (5). These rates occurred in acute-care institutions. There are no reported comparable surveys for long-term care facilities that provide nursing care.

Our data were collected in a 1-day survey carried out in May 1976. The survey's purpose was to gain (a) an understanding of the problems if surveillance is based primarily on record review and (b) preliminary data on the prevalence of certain infections.

The findings were also intended as a pilot study for a more extensive survey to determine whether a nosocomial infection problem exists and whether the establishment of ongoing surveillance in long-term care facilities is warranted. Finally, the survey provided data useful in the development of educational programs and teaching materials on infection control in long-term care facilities.

The survey was limited to institutions that, under the Connecticut Public Health Code, are classified as chronic and convalescent nursing homes and under the Medicare/Medicaid requirements as skilled nursing facilities. These long-term care institutions have facilities and personnel to provide skilled nursing care under medical supervision and direction. They carry out simple, nonsurgical treatment and dietary procedures for patients with chronic diseases or those convalescing from acute diseases or injuries. The Connecticut State Department of Health uses three classifications of long-term care facilities: (a) homes for the aged, (b) rest homes with nursing supervision, and (c) chronic and convalescent nursing homes. Each category provides a different level of medical, nursing, and custodial service, and each must be licensed by the State health department. A patient requiring complex or continuous long-term care would be admitted to a chronic and convalescent nursing home rather than a rest home with nursing supervision.

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## Methods

The resources available to carry out this survey of skilled nursing facilities, in particular trained infection-surveillance personnel, were limited. For this reason, infections were surveyed at only three sites: urinary tract, skin or subcutaneous, and respiratory tract. Infections at these sites were the most frequent in the NNIS, and they were thought to represent a substantial proportion of infections likely to be observed in patients of extended care facilities. In addition, data were sought on patients experiencing fever in the 24 hours before the survey day.

After the criteria for infection were specified, a survey form was designed, and a sample of nursing homes was selected. The nurse responsible for infection control in each facility was to collect the data, and a training session was held for these nurses. This session covered the information to be extracted from the patient record and from laboratory test results.

**Criteria for infection and for fever.** The criteria for infections at the three sites were felt to be relatively objective and easy to apply uniformly. Fever, without specific site of infection, also was examined. An infection was nosocomial if it was not present on admission to the facility. Patient admitted within 48 hours of the survey date were excluded.

The urinary tract infection (UTI) criterion for asymptomatic patients consisted of a bacterial colony count greater than 100,000 colonies per ml from a cultured clean catch or catheter specimen within the previous week. A symptomatic patient was considered to have a UTI if he or she had any two of the following signs or symptoms on the day of the survey: chills, dysuria, frequent urination, or pyuria. The criterion for a skin or subcutaneous infection was any purulent skin or subcutaneous lesion. Cough and purulent sputum were evidence of lower respiratory tract infection.

The criteria for fever were 100.4° or higher rectally, or 99.4° or higher orally on the day of the survey or within 24 hours preceding the survey.

The information requested for each patient with fever or infection, or both, included age and sex, admitting date and diagnosis, patient origin (acute-care, long-term care institution, or home), and whether the patient was admitted with an infection, on antibiotics, or with a Foley catheter. Information on treatment and host factors was also requested. The majority of the host factors were defined as

chronic conditions. The physician's diagnosis in the medical record was accepted as evidence of that condition.

Each institution was further asked to provide the following information on the day of the survey: the total number of patients, patients receiving antibiotics, patients with Foley catheters, and those with such catheters for whom cultures had been performed in the week preceding the survey.

**Sample selection.** A 15 percent stratified random sample of all licensed chronic and convalescent nursing homes, excluding rest homes, in Connecticut was selected. This step resulted in a sample of 31 institutions that were invited to participate in the survey. The purpose of the study was explained to the administrators and their cooperation sought. Of these institutions, 18 elected to participate.

**Training session.** Each institution was to be surveyed by its infection control nurse on the selected date. To achieve uniformity, the training session for these nurses was held the day before the survey, when the procedures to be followed and the forms to be used were explained in detail. To assess the reliability of the data, two members of the project group replicated the survey in three of the institutions on the survey day.

## Results

The background data on all patients, by size of institution, are presented in the table. As noted, approximately 40 percent of the patients in the study were in the three largest institutions. Roughly the same proportions of patients were receiving antibiotics or had Foley catheters regardless of the size of the institution. The overall culture rate, that is the number of patients with Foley catheters who had had cultures performed within 1 week of the survey, was 20 percent and differed among the three groups of institutions (see table).

A total of 55 infections fitting the criteria were recorded, resulting in a 2.7 percent prevalence rate. The rates, by size of facility, were as follows:

<i>Size of institution</i>	<i>Number of patients</i>	<i>Number of infections</i>	<i>Infection rate (percent)<sup>1</sup></i>
100 beds or less . . . .	558	27	4.8
100-150 beds . . . . .	626	15	2.4
151 or more beds . . .	826	13	1.6
Total . . . . .	2,010	55	2.7

<sup>1</sup> Includes only infections of 3 specified types.

Patients in the smaller institutions accounted for

nearly half of the infections. Since only 2 of the 53 patients infected had multiple infections, the patient infection rate, 2.6 percent, was similar to the overall rate.

Infected patients were classified by site of infection:

Infection site	Infections		Percent of all patients
	Number	Percent	
Urinary tract .....	25	45	1.2
Skin .....	23	42	1.1
Respiratory .....	7	13	0.3
<b>Total .....</b>	<b>55</b>	<b>100</b>	<b>2.7</b>

Infections of the urinary tract were the most common, followed by skin and respiratory tract. Fever without an infection at a specific site was present in 15, or 0.7 percent, of the 2,010 patients, and 9, or 17 percent, of the infected patients also had fever.

The infected patients had an average of 2.4 chronic conditions. A review of their medical records suggested that arteriosclerotic vascular disease was overtly present in more than 75 percent, 58 percent were reported to have chronic neurological disease, and 42 percent had chronic urinary tract infections; these were the 3 most common host factors. These chronic conditions, however, probably are equally prevalent in the majority of institutionalized elderly patients—both infected and noninfected—and no comparison group was examined in this survey.

As noted previously, the institutions were asked to report the number of patients receiving antibiotics or with Foley catheters. Twenty, or 16 percent, of the 126 receiving antibiotics and 15, or 15 percent, of the 100 with Foley catheters had a nosocomial infection.

## Discussion

The overall nosocomial infection rate for the three infection sites examined in the 1-day survey was less than 3 percent. This finding must be considered

in the light of a number of possible limitations and qualifications resulting from the study methods.

To begin with, the infections were documented from patients' records rather than patients' examinations. In a 1964 survey of infections in nursing homes, 17 percent of 2,147 patients examined by public health nurses in 101 nursing homes had evidence of infection (6). The criteria for infection in that survey were much broader (they included community acquired infections) than those for the infections examined in our survey. These different approaches to data collection—review of patients' records and examination of patients—undoubtedly contribute to the differences in the rates. It is possible that patients' records in long-term care facilities do not reflect the patients' status on a given day and that examinations would yield a very different rate. Further, it is possible that the patients in the previous study had much more underlying disease or poorer care; either or both of these factors would have contributed to higher infection rates.

Valid comparisons of nosocomial infection rates must be based on similar criteria for infection and similar reporting methods. Although a training session was held for the data collectors, it is possible that the criteria were interpreted differently and that the record review was carried out with different levels of specificity. However, two members of the group initiating the survey attempted to verify the data in three institutions on the survey day. They found the same number of infections in approximately 300 patients' records that the infection control nurse noted; however, in 6 patients' records, chronic conditions or antibiotic treatment had not been reported.

The possible bias introduced in the Connecticut study by the institutions that chose not to participate is not known. However, a telephone followup of several nonparticipating institutions indicated that the primary reason offered for lack of participation in the survey was that the training session for the in-

Number of institutions, patients, and selected treatment factors, by size of institution

Size of Institution	Institutions	Patients		Patients on antibiotics		Patients with catheters		Cultures done for patients with catheters	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
100 or fewer beds .....	10	558	28	34	6	28	5	12	43
101-150 beds .....	5	626	31	36	6	24	4	1	4
151 or more beds .....	3	826	41	56	7	48	6	7	15
<b>Total .....</b>	<b>18</b>	<b>2,010</b>	<b>100</b>	<b>126</b>	<b>6</b>	<b>100</b>	<b>5</b>	<b>20</b>	<b>20</b>

fection control nurses was held in a geographic location which was considered inconvenient. It had been explained to the administrators that only nurses who attended the training session could participate in the survey. Although participating and nonparticipating institutions appeared to be similar with regard to ownership (that is, proprietary and nonprofit) and number of beds, no further attempts were made to document potential biases in the sample for this initial survey.

One issue examined in the survey was whether certain factors—host, treatment, or admission factors—might offer clues to identifying patients at higher risk for developing a nosocomial infection. A comparison of catheterized and uncatheterized patients again supports the well-recognized phenomenon that Foley catheters increase the risk of infection. Fifteen percent of the patients with Foley catheters had a urinary tract infection. With the exception of urinary tract catheterization, it should be noted that relatively few patients in the skilled nursing facilities surveyed were subjected to invasive procedures that might have placed them at risk for infection. For this reason, comparisons of infection rates between acute-care hospitals, where such invasive procedures are more common, and skilled nursing facilities have limited value.

A finding of interest was that, of the 125 patients receiving antibiotics, 20 were reported to have infections of the three types surveyed; another 4 patients had fever without an infection. Thus the remaining 101 patients (81 percent) apparently were receiving antibiotics for an infection not examined in this survey, for prophylactic purposes, or for some other reason.

Another clue to nosocomial infection casefinding might be fever; 9 of the 24 patients with fever had infections of the 3 sites in the survey. Data on patients with fever might have been recorded only in the institutions in which temperatures had been taken within the 24 hours stipulated in the criteria. Because temperatures are not taken daily in some facilities and in some, only once a week, it is possible that fever was underreported; less than 1 percent of all the patients were reported to have fever on the survey day.

These observations suggest that infection control programs in long-term care institutions may encounter problems in data acquisition not common to acute-care facilities. Focusing on three risk factors—Foley catheters, antibiotic treatment, and fever—may alert the infection control practitioner to potential nosocomial infections in extended care facili-

ties, but other sources may have to be surveyed to avoid serious underreporting.

## Conclusions

Although these findings, documented from the patients' records, suggest a low overall infection rate for the three sites of infection, generalizations to an overall rate for other institutions should be made with caution. This qualification is in part due to the methodology used in the survey and the criteria selected to define infection, as well as to the lack of knowledge about the infection rates of the nonparticipating institutions. However, the main reason for raising questions about the validity of the findings is that the patient's record may prove to be highly inadequate as a source for documenting the presence of infections in long-term care institutions.

The issues raised by the findings should be addressed in a study of the incidence of infection, using a larger sample of patients, a number of representative facilities, expanded criteria for infection, and a common data collection team. Patients should be examined to ascertain the probable presence of infection. Depending on the clinical findings, selected laboratory tests, such as urine cultures, chest X-rays, and possibly other tests, might be necessary. Analyses of the data from such comprehensive surveys could indicate the policies that are needed to monitor and prevent infection in patients in long-term care facilities and the treatment methods that are appropriate for a predominantly elderly population. The objective of a future survey should be to identify the infections that are avoidable. On the basis of the findings, medical and nursing care plans could be carried out to reduce the avoidable infections and to minimize the discomfort associated with infections that are difficult to prevent in the older patient.

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